

REMARKS

In the above-captioned Final Office Action, the Examiner has rejected Claims 1-5 under 35 U.S.C. §103(a) for being unpatentable over the Fields et al. reference, when further considered in view of the Marchitto et al. and Roberson references.

In response, independent claims 1 and 5 have been amended to recite a multiple mode laser slab with a rectangular cross-section having polished side surfaces, so that laser pump light that is absorbed along the entire length of the laser slab. This configuration ensures laser mode overlap throughout the entire length of the laser slab, which further allows the device to operate over a wide range of pump light wavelengths resulting from varying temperatures. Claims 2-4 have been amended to correct informalities and to establish proper dependency from amended independent claim 1, and new claim 6 has been added. Support for these amendments and new claim is found in the specification on page 2, line 20 through page 3, line 9, on page 6, lines 6-15, and in Figs. 1 and 2. Claims 1-6 remain pending.

Rejections Under 35 U.S.C. §103(a)

With respect to the rejections of Claims 1 and 5, consider the overall goal of Applicant's invention. What is desired is a lightweight laser that efficiently converts pump light into a relatively high-energy beam high output laser beam with over a wide variety of temperatures (see Page 1, Lines 16-22) as the present invention is to be used as a handheld laser rangefinder that must operate in extreme cold and extreme heat conditions. To address the weight issue, diode bars are used to generate the laser pump light, but for diode pumped lasers the pump light wavelength varies according to temperature. Since a temperature control system is not feasible due to the added weight, the structure of the device must compensate for the varying pump light wavelength.

The structure and geometry of the laser slab combined the first and second cylindrical lenses this is recited in amended claims 1 and 5, and new independent claim 6, compensates for this varying pump light wavelength. Specifically, a laser slab with a rectangular cross section and polished sides must be used, and the laser pump light must be collimated in a vertical direction with a first lens and then directed into the slab with the second lens. The cross section geometry and polished side surfaces of the slab allow more of the laser pump light to be absorbed within the active laser ion in the crystal along the entire length of the laser slab (Page. 4, lines 4-9). This configuration ensures that most of the pump light is absorbed, even if the absorption coefficient is low, resulting in a laser that will operate efficiently over a wide temperature range even as the laser diode pump wavelength varies.

In stark contrast to Applicant's invention as recited in amended claims 1 and 5, and new claim 6. Fields et al. discloses a laser rod 8 with a laser mode 10 concentric thereto. (Col. 5, Lines 35-40 and Col. 6, Line 13). Of course, since the lasing material is a rod, there are no opposing side surfaces for laser pump light to reflect off of. Indeed, the recited structure of the Field et al. reference is such that laser pump light remains confined within mode 10 and never touches the inside surface of the laser rod. Moreover, the pump light from the second cylindrical lens in Fields et al. is focused to a single spot 32. This is because the Fields et al. reference is directed at obtaining a highly efficient laser output beam for diode bar pump light at a single mode, the single TEM₀₀ mode (See Fields et al. Abstract), and not at multiple modes according to the diode laser pump light wavelength (which, again, varies widely with temperature). This is because Fields et al. is directed at using a plurality of diode bars and a microlens array to couple the laser pump light from each diode bar and create an high power output laser beam with minimum loss of power. The device recited in Fields does not have to operate over a wide temperature range, so there is no discussion or teaching of the structure recited in Applicant's amended claims 1 and 6.

Similarly, Marchitto et al. discloses a laser pump-cavity 18 containing a laser rod 20 and a flashlamp 22 supported therein (Please see Col. 22, Lines 1-9 and Fir. 3). Moreover, the only finish envisioned for any surface for the rod is a matte finish, not a polished surface. Moreover, Marchitto et al. describes alternate configurations for the matte finish 20 (See Col 22, Lines 41-64 and Figs. 13-15). However, Marchitto et al. does not even remotely address the need for a laser slab having a rectangular cross-section and/or polished opposing sides to compensate for varying diode pump light wavelength. The Marchitto et al. reference does not teach or suggest a laser slab with a rectangular cross-section and polished sides, because this structure is not needed. This is because the Marchitto et al. device is directed medical applications, specifically interstitial fluid monitoring, hence, there is no need for the device to work over a wide range of temperature and varying pump light wave lengths. Thus, combining the Marchitto et al. reference with the Fields et al. reference does not lead to the present invention recited amended claims 1 and 5.

With respect to the Robertson reference, this reference is directed at heat removal from flashlamp pumped lasers, which are transversely pumped, and which create more waste heat relative to other pumping methods for lasers (Col. 1, Lines 36-40). Even if the Robertson reference was used in conjunction with a diode pump, the cross section in Robertson has polished upper and lower surface and rough-ground side surfaces, as opposed to polished side surfaces. Contrary to the Examiner's assertion, it would not be obvious to merely rotate the slab and call the top and bottom surfaces the side surfaces to minimize heat generation. This is because the whole point of the Roberson device is to reduce the transverse temperature gradient ΔT_a , which is across the width of the laser cross section.

Furthermore, the device cited in Robertson (which is commonly referred to as a zig

zag slab), uses the polished top and bottom surfaces for total internal reflection of the laser mode. Since Robertson teaches heat dissipation by rough grinding the side surfaces in Robertson, the Robertson reference actually teaches away from Applicant's claimed invention (Please see Col. 1, Lines, 36-40, Col. 4, Lines 16-30 and Fig. 1). And since the Robertson device is transversely pumped, if the Robertson slab is rotated as Examiner asserts, the device will not work. Conversely, Applicant's side surfaces are polished to confine the pump light, which has been collimated in a vertical direction by the cylindrical lenses arrangement. Thus, there is no teaching or suggestion to combine Robertson with either of the Fields et al. and/or Marchitto et al. references, and any combination thereof still does not lead to the claimed invention in amended independent claims 1 and 5.

For the above reasons, the rejection of claims 1-5 is improper, and amended independent claims 1 and 5 are patentable over any combination of Fields et al., Marchitto et al. and Robertson. Dependent claims 2-4 and new independent claim 6 contain the same limitations as amended independent claims 1 and 5 and are allowable for the same reason. Reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

All of the stated grounds of rejection have been properly traversed, accommodated or rendered moot. Applicant has made a bona fide effort to remove informalities from the specification, and to properly amend the claims, and Applicant believes that a full and complete reply has been made to the outstanding Office Action, and that the present application is in a condition for allowance. Accordingly, a Notice to that effect is most respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully

requested.

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Respectfully submitted,



Arthur K. Samora, Reg. No. 43079

Department of the Army

CECOM Intellectual Property Division

AMSEL-LG-C-NVESD

10225 Burbeck Road

Fort Belvoir, VA 22060-5806

(703) 704-2227